

CLAIMS

What is claimed is:

1. A tri-mode over-voltage circuit protection and disconnect apparatus, the apparatus comprising:

- a. a first over-voltage protection circuit disposed between a hot line and a ground line;
- b. a second and a third over-voltage protection circuit disposed between the hot line

and a neutral line; and

c. a fourth over-voltage protection circuit disposed between the neutral line and the ground line;

whereby the hot line and the neutral line are distributed as an output voltage when the over-voltage protection circuits are functioning, and

whereby, in the event of an over-voltage condition, at least one of the first, second, third and fourth over-voltage protection circuits responds by passing sufficient current to cause a protective device to open.

2. The apparatus as recited in claim 1 wherein the protective device is selected from the group consisting of fast-blow fuse, slow-blow fuse, thermal fuse, circuit breaker.

3. The apparatus, as recited in Claim 2, further comprising:
at least one warning feature for indicating that an over-voltage condition has occurred, the at least one warning feature being selected from a group of warning features consisting of an indicator light, an LED indicator, and an audible alarm.

4. The apparatus, as recited in Claim 3,
wherein each of the over-voltage protection circuit comprises:

- a. a respective protective device; and
- b. a respective metal oxide varistor (MOV),

wherein the respective protective device associated with the first over-voltage protection circuit is disposed in parallel with the ground line and hot line,

wherein the respective protective device associated with the second over-voltage

protection circuit is disposed in series with the neutral line,
wherein the respective protective device associated with the third over-voltage
protection circuit is disposed in series with the hot line,
wherein the respective protective device associated with the fourth over-voltage
protection circuit is disposed in parallel with the ground line and neutral line,
wherein the respective MOV associated with the first over-voltage protection circuit,
is disposed in parallel with the hot line and the ground line,
wherein the respective MOV associated with the second over-voltage protection circuit
is disposed in parallel with the hot line and the neutral line,
wherein the respective MOV associated with the third over-voltage protection circuit
is disposed in parallel with the hot line and the neutral line,
wherein the respective MOV associated with the fourth over-voltage protection circuit
is disposed in parallel with the neutral line and the ground line; and
whereby the respective MOV associated with the fourth over-voltage protection circuit
being disposed in a manner facilitating response to an over-voltage condition occurring
between the neutral line and the ground line.

5. A tri-mode over-voltage protection and disconnect circuit apparatus as recited in claim 1, further comprising at least one electronic interference filter.
6. The apparatus as recited in claim 4 wherein the protective device is selected from the group consisting of fast-blow fuse, slow-blow fuse, thermal fuse, circuit breaker.
7. A tri-mode over-voltage protection and disconnect circuit apparatus, the apparatus comprising:
 - a. a first over-voltage protection circuit disposed between a hot line and a ground line;
 - b. a second and a third over-voltage protection circuit disposed between the hot line and a neutral line;
 - c. a fourth over-voltage protection circuit disposed between the neutral line and the ground line;
 - d. at least one warning feature for indicating that an over-voltage condition has

occurred, the at least one warning feature being selected from a group of warning features consisting of an indicator light, an LED indicator, and an audible alarm; and wherein

5 8. The apparatus, as recited in Claim 7,
 wherein each of the over-voltage protection circuits comprises:

- a. a respective protective device; and
- b. a respective metal oxide varistor (MOV),

 wherein the respective protective device, associated with the first over-voltage
10 protection circuit, is disposed in parallel with the ground line and hot line,
 wherein the respective protective device, associated with the second over-voltage
 protection circuit, is disposed in series with the neutral line,
 wherein the respective protective device, associated with the third over-voltage
 protection circuit, is disposed in series with the hot line,
15 wherein the respective protective device, associated with the fourth over-voltage
 protection circuit, is disposed in parallel with the ground line and neutral line,
 wherein the respective MOV, associated with the first over-voltage protection circuit,
 is disposed in parallel with the hot line and the ground line,
 wherein the respective MOV, associated with the second over-voltage protection
20 circuit, is disposed in parallel with the hot line and the neutral line,
 wherein the respective MOV, associated with the third over-voltage protection circuit,
 is disposed in parallel with the hot line and the neutral line,
 wherein the respective MOV, associated with the fourth over-voltage protection circuit,
 is disposed in parallel with the neutral line and the ground line; and
25 whereby the respective MOV, associated with the fourth over-voltage protection
 circuit, being disposed in a manner facilitating response to an over-voltage condition
 occurring between the neutral line and the ground line.

9. The apparatus as recited in claim 7 wherein the protective device is selected from the
 group consisting of fast-blow fuse, slow-blow fuse, thermal fuse, circuit breaker.

10. A tri-mode over-voltage protection and disconnect circuit apparatus as recited in claim 7, further comprising at least one electronic interference filter.

11. A tri-mode over-voltage protection and disconnect circuit apparatus, the apparatus comprising:

- a. a first over-voltage protection means disposed between a hot line and a ground line;
- b. a second and third over-voltage protection means disposed between the hot line and

5 a neutral line; and

c. a fourth over-voltage protection means disposed between the neutral line and the ground line,

whereby, in the event of an over-voltage condition on the hot line, the second and third over-voltage protection means respond by each opening a thermal protective device, thereby simultaneously causing an open state such that the hot line and the neutral line are not distributed as an output voltage.

12. The apparatus as in claim 11 wherein each of the over-voltage protection means comprises:

- a. a respective protective device; and
- b. a respective metal oxide varistor (MOV),

wherein the respective protective devices, associated with the first and second over-voltage protection circuits, are disposed in series with the hot line,

wherein the respective protective device, associated with the third over-voltage protection circuit, is disposed in parallel between the hot line and the neutral line,

wherein the respective MOV, associated with the first over-voltage protection circuit, is disposed in parallel with the hot line and the ground line,

wherein the respective MOV, associated with the second over-voltage protection circuit, is disposed in parallel with the hot line and the neutral line, and

whereby the respective MOV, associated with the fourth over-voltage protection circuit, being disposed in a manner facilitating response to an over-voltage condition occurring between the neutral line and the ground line.

13. The apparatus, as recited in Claim 11, further comprising:

at least one warning feature for indicating that an over-voltage condition has occurred, the at least one warning feature being selected from a group of warning features consisting essentially of an indicator light, an LED indicator, and an audible alarm.

14. The apparatus as recited in claim 11 wherein the protective device is selected from the group consisting of fast-blow fuse, slow-blow fuse, thermal fuse, circuit breaker.

15. A tri-mode over-voltage protection and disconnect circuit apparatus as recited in claim 11, further comprising at least one electronic interference filter.

16. A method of protecting at least one peripheral device from an over-voltage conditions, the method comprising:

providing a tri-mode over-voltage protection and disconnect circuit apparatus, the apparatus comprising:

a. a first over-voltage protection circuit disposed between a hot line and a ground line;

b. a second and a third over-voltage protection circuit disposed between the hot line and a neutral line; and

c. a fourth over-voltage protection circuit disposed between the neutral line and the ground line;

the apparatus providing AC power to the at least one peripheral device, whereby the hot line and the neutral line are not distributed as an output voltage when the second and third over-voltage protection devices has opened a protective device.

17. The method, as recited in Claim 16, further comprising:

providing at least one warning feature for indicating that an over-voltage condition has occurred, the at least one warning feature being selected from a group of warning features consisting essentially of an indicator light, an LED

indicator, an audible alarm; and

warning that an over-voltage condition has occurred by activating the provided warning feature.

18. The method of claim 16 further comprising providing an electronic interference filter on the input of the apparatus.
19. The method of claim 16 further comprising providing an electronic interference filter on the output of the apparatus.

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